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THE DEVELOPMENT OF THE TREE-TOAD.¹

BY MARY H. HINCKLEY.

A RECORD of several seasons gives the appearance of *Hyla versicolor* in the spring, in Milton, Massachusetts, from about the 1st to the 10th of May. Tadpoles of this species I have found most abundant in the water of small, still, shadowy ponds near large trees. The eggs are attached singly and in small groups for a distance of one or two yards along the grasses which grow up and rest on the water. Unless the grass is parted they are not readily seen. The gelatinous substance surrounding the eggs is exceedingly thin. When first laid they are of a drab color on the upper surface, which becomes lighter after a few hours in the water. The under surface is white; the extent of this color varies; in some cases only a spot of drab is seen on an otherwise white egg. The period of egg-laying, according to my observations, extends from the first week in May to July. The development of the egg is rapid, being accomplished within forty-eight hours. When first hatched the tadpole is about a quarter of an inch long, of a pale yellow color, dotted with olive on the head and sides of the body. During the first week the external gills are developed and resorbed. At the same time the olive color gradually increases and deepens till it extends over the upper surface of the tadpole. A fine dotting of gold color also appears on both upper and under surfaces. In the water, however, they look black. The holders, at first so prominent, disappear within ten days. The head and body are short. The tail is broad and thick. The eyes are prominent, set widely apart, and of a brilliant flame color; the iris in some specimens is quartered by dark lines. The lips are broad. The nostril openings and two perpendicular lines on the muzzle, also a line from before the eyes down each side to the tail, are gold colored. Transverse bars of the same tint on the upper edge of the tail are sometimes seen.

The tadpoles are shy and quick in movement as young fishes, moving through the water with the least perceptible motion of the tail. They do not collect together, but where there is room enough, each tadpole goes its own way independently. They are hardy, and probably owing in some degree to their quick move-

¹ Abstract of a paper published in the Proceedings of the Boston Society of Natural History, Vol. XXI, Nov. 17, 1880.

ments, are more exempt from mutilation by water enemies than other species, rarely losing eyes or tail.



HINCKLEY, DEVELOPMENT OF *Hyla versicolor*.

When about three weeks old the hind legs are in sight as small white buds in front of the base of the tail near the lower edge on

each side. An iridescence of great brilliancy is seen on the white surface of the abdomen and sides of the body. The head and upper portion of the body show a bluish, metallic sheen, and the tail, which is more or less flecked with brown or black, becomes in some specimens a bright red color. It would be difficult to exaggerate the beauty of coloring of these tadpoles, it exceeds in brilliancy and variety any species found in this locality.

As the legs become more fully developed, the coloring of the head and body tends from dark olive to a light, grayish-green. In the seventh week the body begins to lose its roundness, and the arms are seen to be moved under the skin, as if the tadpole were impatient to get them free. The head then appears disproportionately large. At this stage the tadpoles vary from gray to pea-green in color. They are found in the shallow water near the shore, where many fall prey to various aquatic birds. During the eighth week they appear to take little food; the arms are thrown out, the tail is gradually resorbed, the mouth developed, and the frogs leave the water. While a few specimens retain the color of gray up to this time, nearly all will be found of various shades of tender green on the upper surfaces, bordered with different tints of gray or salmon color. The abdomen is white. Green asserts itself much earlier in some specimens than others; but I have never seen a tadpole of this species develop into the frog that did not sooner or later become green. The markings on the back also vary in time of appearance; but the coloring of black on the head, body and limbs, the smooth shiny patch below the eyes, the granulated appearance of the skin, and the yellow coloring in the folds of the legs, usually appear in the order of their mention, and after the frogs have left the water.

Last season a small pond in an open pasture, about fifteen rods from a wood, furnished a good opportunity for observing their movements on leaving the water. From the 19th to the 24th of July, numbers of the young frogs, with tails in different stages of resorption, were found on the ground, weeds, and grasses about the pond, which by this time had become reduced by evaporation to a shallow pool. They represented a variety of shades of green; a few were gray, and occasionally one was scarcely to be separated in color from the mud on which it rested. I observed those on the ground frequently capture the small spiders which were numerous there. As soon as they left the water their object,

evidently, was to reach the wood. Apparently aware of their danger in this exposed journey, they drew attention to themselves, when approached, by continually springing out of harm's way; but after the shrubbery was reached they rarely made any attempt to escape when discovered, trusting wholly, like the mature frogs, to their disguise of coloring for safety. I found several of them on a small apple tree which was in the line of their journey. They were on the new growth which was overrun with Aphides, and the frogs had assumed a deep emerald-green, so like the leaf that it was difficult at first glance to distinguish them from it. After they reached the wood I could trace them no farther. I think it probable that some observers have mistaken *H. versicolor* at this age for the adults of another species of *Hyla*.

My knowledge of the frogs from this stage till they reach maturity, is confined chiefly to those reared in a fernery. For the first three months they retained the green color, as a rule, with occasional changes to tints of brown and gray, matching the earth or branches to which they clung. After that time shades of gray became the rule and green the exception. The black markings on the head, body and limbs did not change excepting to vary in distinctness. Their food, which they never took unless alive, was Aphides at first, but soon flies formed their chief diet. During the day they commonly remained motionless, hidden behind the bark of the branches, with feet and hands, which are evidently extremely sensitive, compactly folded under the body, so that only their outer edges came in contact with the surface on which they were seated. Occasionally they would pat the disks against the sides of the body as if to moisten them. Their activity was reserved for the night, although rain accompanied by a south wind, caused them to move about uneasily. About the 1st of October they left the branches and ferns and nestled away in the damp earth and moss, where they remained through the winter, unless exposed to a temperature above 60°. They took no food from the first week in October till the 14th of the following May, when I gave them their liberty. They were then placed on an oak tree, where, after climbing till a suitable crevice or hiding place was found, they backed themselves into it and became to all appearance like a part of the bark of the tree.